Fairfield-Suisun Urban Runoff Management Program

The City of Vallejo and the Vallejo Sanitation and Flood Control District

Integrated Monitoring Report

Part C: Pollutants of Concern Implementation Plan

Work Plan for Implementation of NPDES Permit Provision C.11 and C.12

"Control Program for Polychlorinated Biphenyls (PCBs) and Mercury"

March 15, 2014

INTRODUCTION

This Pollutants of Concern Implementation Plan for Polychlorinated Biphenyls (PCBs) and Mercury (Hg) is being submitted to the San Francisco Bay Regional Water Quality Control Board (Regional Board) by the Fairfield-Suisun Urban Runoff Management Program (FSURMP), the City of Vallejo and the Vallejo Sanitation and Flood Control District (Vallejo Programs) on behalf of Solano County's four Phase 1- Region 2 permittees (Solano Permittees), as required by Provisions C.8, C.11 and C.12 of the Municipal Regional Stormwater NPDES Permit (MRP) (Order R2-2009-0074) adopted on October 14, 2009.

The implementation approach is based on lessons learned about PCB controls from pilot projects implemented throughout the San Francisco Bay Area, through past studies and a regional project implemented by the Bay Area Stormwater Management Agencies Association during the first permit term of the MRP. Lessons learned were derived from pilot projects in all participating counties.

It is important to note that Water Board staff is currently developing a second regional MRP (MRP 2). This MRP 2 is anticipated to replace the current Phase 1 MRP for stormwater program's throughout the San Francisco Bay Area. MRP 2 will include new PCB and mercury requirements related to the San Francisco Bay POCs TMDLs. Such new requirements would potentially supersede the current requirements in the current MRP, and necessitate modification of one or more of the tasks presented in this work plan.

The Solano Permitees (City of Fairfield, City of Suisun City, City of Vallejo, the Vallejo Sanitation and Flood Control District) collaborating on this Integrated Monitoring Report (IMR) Part C constitute approximately 4.7% of the population total for all cities named on the MRP. Larger programs have had the advantage to pool additional resources to provide further information to by the Regional Board. Some information needed by the Regional Board to provide subsequent MRP 2 provisions may not be provided here. With the lack of a truly regional Integrated Monitoring Report, additional information needs can be located in the four large (Contra Costa, Alameda, Santa Clara and San Mateo) program IMRs.

Background[1]

PCBs were manufactured in the United States from 1929 to 1977. They were widely used by many industries because of their low electrical conductivity, high boiling point, chemical stability and flame retardant properties. The largest use of PCBs was in electrical equipment, including transformers and capacitors, but they were also widely found in a variety of other applications, including hydraulic fluids, dust control, flame retardants, lubricants, paints, sealants, wood preservatives, inks, dyes and plasticizers (Abbot 1993, Binational Toxics Strategy 1998 and 1999, EIP Associates 1997). PCBs have also been found in a variety of non-liquid materials, including construction materials such as insulation, roofing, and siding materials (64

[1] Taken from: Review of Potential Measures to Reduce Urban Runoff Loads of PCBs to San Francisco Bay, by EOA, Inc. for Santa Clara Valley Urban Runoff Pollution Prevention Program, March 2004.

CFR Part 761). In 1979, the US EPA banned the manufacture of PCBs in the United States. Their import, export, and distribution in Commerce were also banned and PCBs uses were restricted to totally enclosed applications. The US EPA has authorized other minor uses since that time, but the unavailability of PCBs and health and safety concerns effectively ended their use in new applications.

PCBs are often referred to as a "legacy" pollutant, meaning there are relatively few current uses, but past uses have left large amounts in the environment. Based on sediment chemical analysis data, the widespread historic uses of PCBs apparently resulted in releases to soils and storm drains in the Bay Area. Since PCBs are highly persistent and associate with particulate matter, soils and accumulated storm drain sediments potentially contain PCBs released many years ago.

Potential pathways for PCBs to have entered soils and storm drains include intentional and unintentional aboveground historic releases and illicit connections to storm drain lines. For example, the use of hydraulic fluids containing PCBs has significant potential to result in releases to the environment, since hydraulic systems were designed to leak slowly to provide lubrication (Binational Toxics Strategy 1998). Because the use of PCBs is currently limited and strictly regulated, the potential for new releases to the environment has likely been greatly diminished.

Characterization of PCBs Distribution

The Solano Programs collaborated with several other Bay Area stormwater management agencies to measure concentrations of PCBs and other pollutants of concern in embedded sediments collected from stormwater conveyances throughout the Bay Area (KLI 2002). This two-year field study is referred to as the Joint Stormwater Agency Project (JSAP). The primary study Goal was to characterize the distribution of pollutants among land uses in watersheds draining to the Bay. A total of about 150 samples were collected during the fall of 2000 and 2001. More than six of the samples were collected within the Solano Program's jurisdiction in residential/commercial, industrial, open space and mixed land uses.

An analysis of the complete project data set revealed that median PCBs concentrations normalized to fines (less than 62.5 microns) were over 100 times higher in samples from urban sites compared to open space sites. Concentrations of PCBs were highly variable in urban samples, with relatively elevated concentrations found in some samples. Statistically significant differences in normalized concentrations of PCBs were not found between industrial and residential/commercial sites.

Recently, Source Area Maps were developed by EOA. Inc. for the purposes of describing PCB distribution throughout the Bay Area cities and counties permitted on the MRP. Armed with historical information, EOA utilized GIS layers from land use and facility types located in the Bay area during the time period between the late 1920s to the late 1970s. This window of time represents the era when PCB and mercury production was greatest in the United States.

A metadata Summary of the San Francisco Bay Area Old Industrial Land Areas generated by EOA includes the following:

<u>Old Industrial Land Areas (1968)</u>

Summary: This layer was created to depict industrial land areas present in 1968. The layer is intended to contribute to a larger mapping and modeling effort designed to spatially depict land areas that may be sources of Polychlorinated Biphenyls (PCBs) or mercury in the San Francisco Bay Area. The land areas are termed “old industrial” due to their presence prior to roughly 1970, the timeframe when PCB production in the U.S. ceased. Old industrial land parcels in Alameda, Contra Costa, San Mateo, Santa Clara and Solano counties are depicted. Parcels in the datalayer are defined via the most currently available assessor’s parcel data for each county.

Procedures for Development of Layer:

1. Three sets of datalayers were acquired and served as the primary sources of information needed to create the old industrial datalayer: 1) the 2005 version of the Association of Bay Area Governments (ABAG) land use datalayers for the five counties, which depicts current industrial land areas; 2) 1968 EarthExplorer aerial photographs for the Bay Area at 30,000 scale; and 3) most currently available Assessor parcel datalayers for the five counties.
2. Two new datalayers were then created. The first depicted industrial land areas in 1968 that are not currently characterized as industrial by ABAG. This datalayer was created by panning through the 1968 aerials and identifying industrial land areas outside of the areas characterized as industrial land use in the ABAG datalayer. The second datalayer depict areas within the areas characterized by ABAG as industrial land use that were not industrial in 1968. This datalayer was created by panning through the 1968 aerials and identifying land areas within the areas characterized as industrial land use in the ABAG datalayer that were not industrial in 1968.
3. Performed an "erase" in ArcGIS to remove areas from the ABAG datalayer that were not industrial in 1968, and a performed a "union" to add 1968 industrial areas outside of those characterized as industrial in ABAG, back into the ABAG datalayer.
4. Performed an "intersect" in ArcGIS with the Assessor parcel datalayers for the five counties to create a shapefile of all parcels that were at least partially industrial in 1968.
5. All parcels that were identified as at least partially industrial in 1968 were then visually checked in the datalayer to provide greater confidence in its accuracy. Minor edits were made based on this quality assurance check.
6. Attempted to analyze each parcel that was identified as at least partially having industrial land use in 1968 to determine if it had been redeveloped and noted the current land use.

Considerations:

- Many of the parcels are only partially industrial and so this layer should not be used to calculate the total area of old industrial land in the Bay Area.
- The layer may or may not contain railroads and railroad facilities. Although railroads are a type of industrial land, separate GIS datalayers are under development and should be used as the primary source for information regarding railroads.
- Parcels may be missing if not included in the original parcel datalayers received from the counties.

- The accuracy of this layer is only as good as the ABAG land use datalayer and the ability to identify what is and what is not industrial in 1968 aerial photographs that are of marginal quality and often difficult to make out land use. For analyzing smaller areas in higher detail, additional aerials can be downloaded from http://earthexplorer.usgs.gov/ and georeferenced in ArcGIS.
- If a property was developed by 1968 and it was not possible to determine the land use, then the parcel was left in the old industrial datalayer. Land uses such as some farms and office buildings are often indistinguishable from industrial parcels and therefore were included. This is especially relevant where it is noted that parcels have been redeveloped into industrial land uses.
- Parcels around ports were removed and put into their own datalayer, therefore this datalayer should be used in conjunction with the Ports datalayer as there should be no overlaps.

Ports

This layer was created to depict the three major port areas within the Bay Area (Oakland, Richmond, and Redwood City). This layer should be used in conjunction with the Old Industrial Land Areas layer as there are no overlapping areas and land use in port areas have not changed since the 1960's. This layer was created by performing an intersect in ArcGIS with the 2005 version of the Association of Bay Area Governments (ABAG) land use ports layer with the most currently available Assessor's parcel datalayers for the five counties (Alameda, Contra Costa, San Mateo, Santa Clara, and Solano) and only keeping parcels that were at least partially industrial. Parcels were removed that were outside the three major ports, including the many marinas that are misclassified in the ABAG data. Minor edits were then made to include and exclude parcels to depict a more accurate port boundary. No major ports are located within the Solano Programs generating this report. This layer has been turned off.

Military

This layer was created to depict the military areas within the Bay Area. It was created by performing an intersect in ArcGIS of with the 2005 version of the Association of Bay Area Governments (ABAG) land use military layer with the most currently available Assessor's parcel datalayers for the five counties (Alameda, Contra Costa, San Mateo, Santa Clara, and Solano) and only keeping parcels that were at least partially military. It was then edited to remove parcels that are not military, not developed, VA buildings, and military hospitals. This layer has been turned off.

FSURMP POC Source Area Mapping

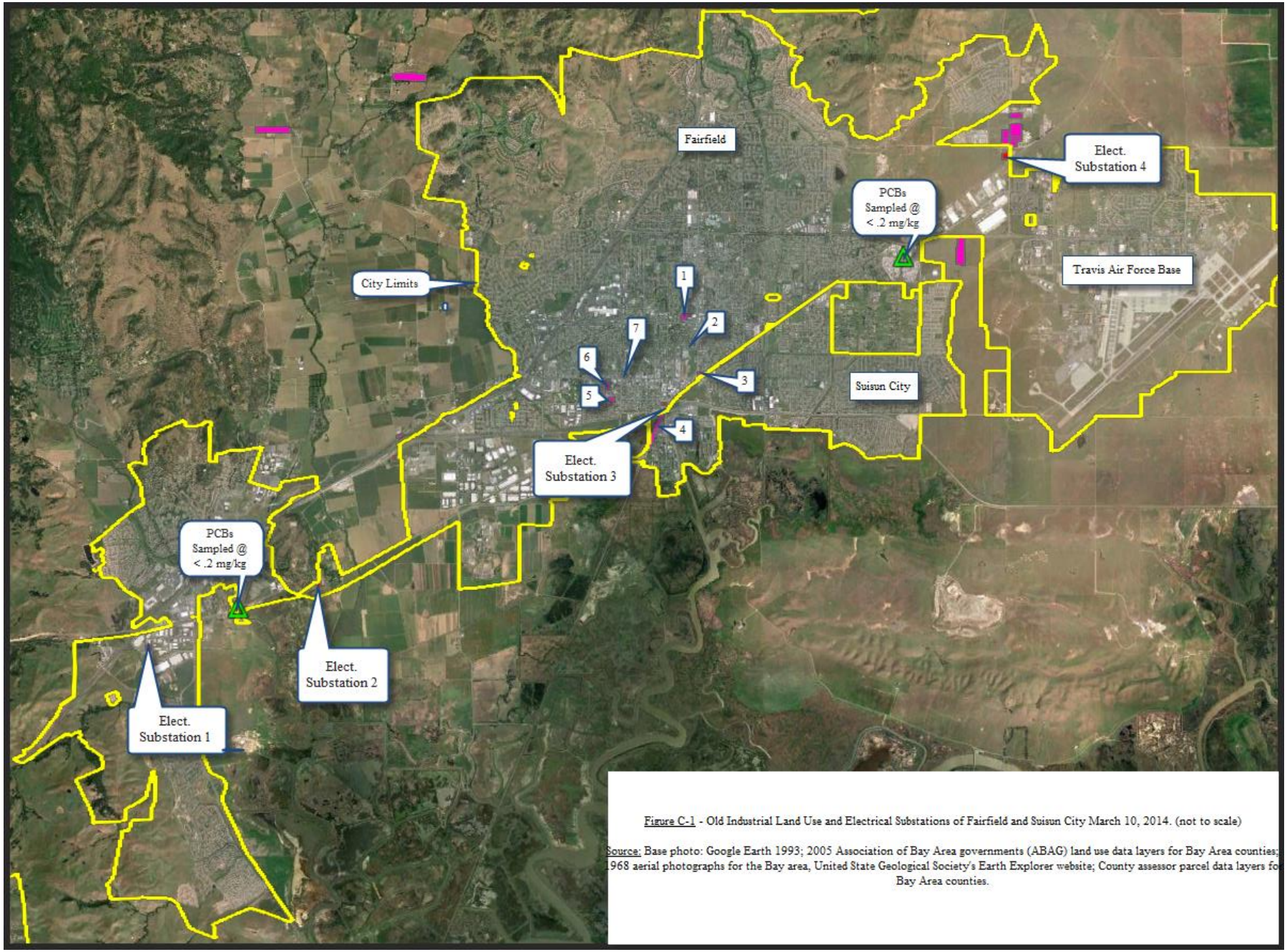


Figure C-1 - Old Industrial Land Use and Electrical Substations of Fairfield and Suisun City March 10, 2014. (not to scale)

Source: Base photo: Google Earth 1993; 2005 Association of Bay Area governments (ABAG) land use data layers for Bay Area counties; 1968 aerial photographs for the Bay area, United State Geological Society's Earth Explorer website; County assessor parcel data layers fo Bay Area counties.

Fortunately, for the cities of Fairfield and Suisun City there has been very little PCB related industrial activity occurring in the history of the two cities. The lack of areas delineated in pink in figure C-1 depict the lack of heavy industrial activities through historical records. Travis Air Force Base is primarily a hub for military airplane deployment and maintenance, not manufacturing. Furthermore, Travis Air Force Base is a federal facility under its own NPDES permit for discharge of stormwater.

The following is a brief explanation of the areas 1 through 7 shown on figure C-1. The explanations include Google Earth aerial photographs of current land conditions, and land use activities along with a description of current city activities to improve current water quality conditions.

Old Industrial - Area 1

Old industrial Area 1 is currently a commercial facility located in Fairfield at the intersection of Travis Blvd. and N. Texas St.. The use is a strip mall with a storage facility located behind. Nearly all of the parcel has been paved and the streets have curb and gutter. Streets in this area are swept every other week. There does not appear to be an opportunity for PCB remediation at this location.

Old Industrial - Area 2

Old industrial Area 2 is currently a commercial facility located in Fairfield at the intersection of Bell Avenue and N. Texas St.. The facility does not appear to be occupied, but based on the storefront was historically a lithographic production company. Nearly all of the parcel has been paved and the streets have curb and gutter. Streets in this area are swept every other week. There does not appear to be an opportunity for PCB remediation at this location.

Old Industrial - Area 3

Old industrial Area 3 is currently a Ramos Oil petroleum distribution facility located in Fairfield at 744 N. Texas St.. The facility is currently active. Nearly all of the parcel has been paved and the streets have curb and gutter. Streets in this area are swept every other week. FSURMP commercial and industrial inspections have been regularly performed and the facility is currently in compliance.

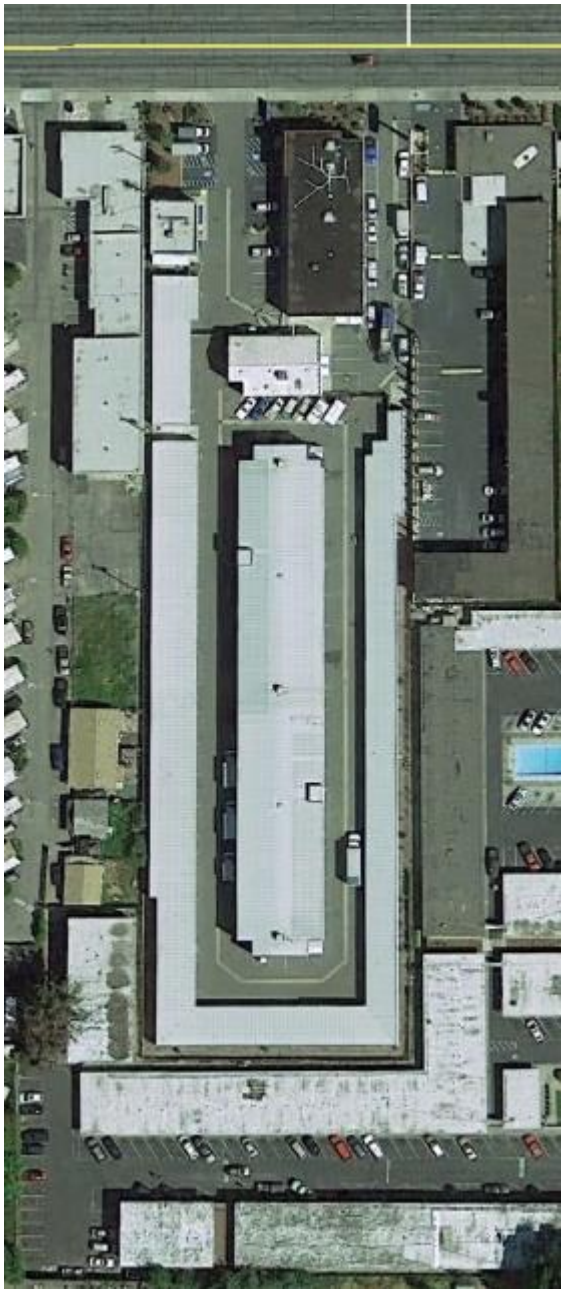
Old Industrial - Area 4

Old industrial Area 4 is currently Railroad Tracks along with some paved streets and strip malls in Suisun City. The area is zoned Regional Commercial. Most of the facilities in this Old Industrial area are open and active. Actual land uses consist of: massage parlors; motorcycle repair; churches; roofing supply; pesticide applicators; and automotive repair. Nearly all of the area has been paved and the streets have rolled curb and gutter. Streets in this area are swept on a monthly basis.

Old Industrial - Area 5

Old industrial Area 5 is currently Canova Moving and Storage located at 1336 Woolner Ave. The facility is zoned Medium Density Residential. Nearly all of site has been paved and the streets have curb and gutter. Streets in this area are swept on a weekly basis.

Old Industrial - Area 6



Old industrial Area 6 is currently a Self Storage facility located at 1411 W. Texas St.. The facility is zoned Community Commercial. Nearly all of site has been paved and the streets have curb and gutter. Streets in this area are swept on a biweekly basis. There does not appear to be an opportunity for PCB remediation at this location.

Old Industrial - Area 7

Old industrial Area 7 is currently Fairfield Daily Republic newspaper building located on the northeast corner of Pennsylvania Avenue and W. Texas St.. The facility is zoned Community Commercial. Nearly all of the site has been paved and the streets have curb and gutter. Streets in this area are swept on a bi-weekly basis. There does not appear to be an opportunity for PCB remediation at this location.

Vallejo Permitees POC Source Area Mapping

The City of Vallejo has been delineated into four areas for the purpose of compliance with C11 & C12 (See Figure C-2).

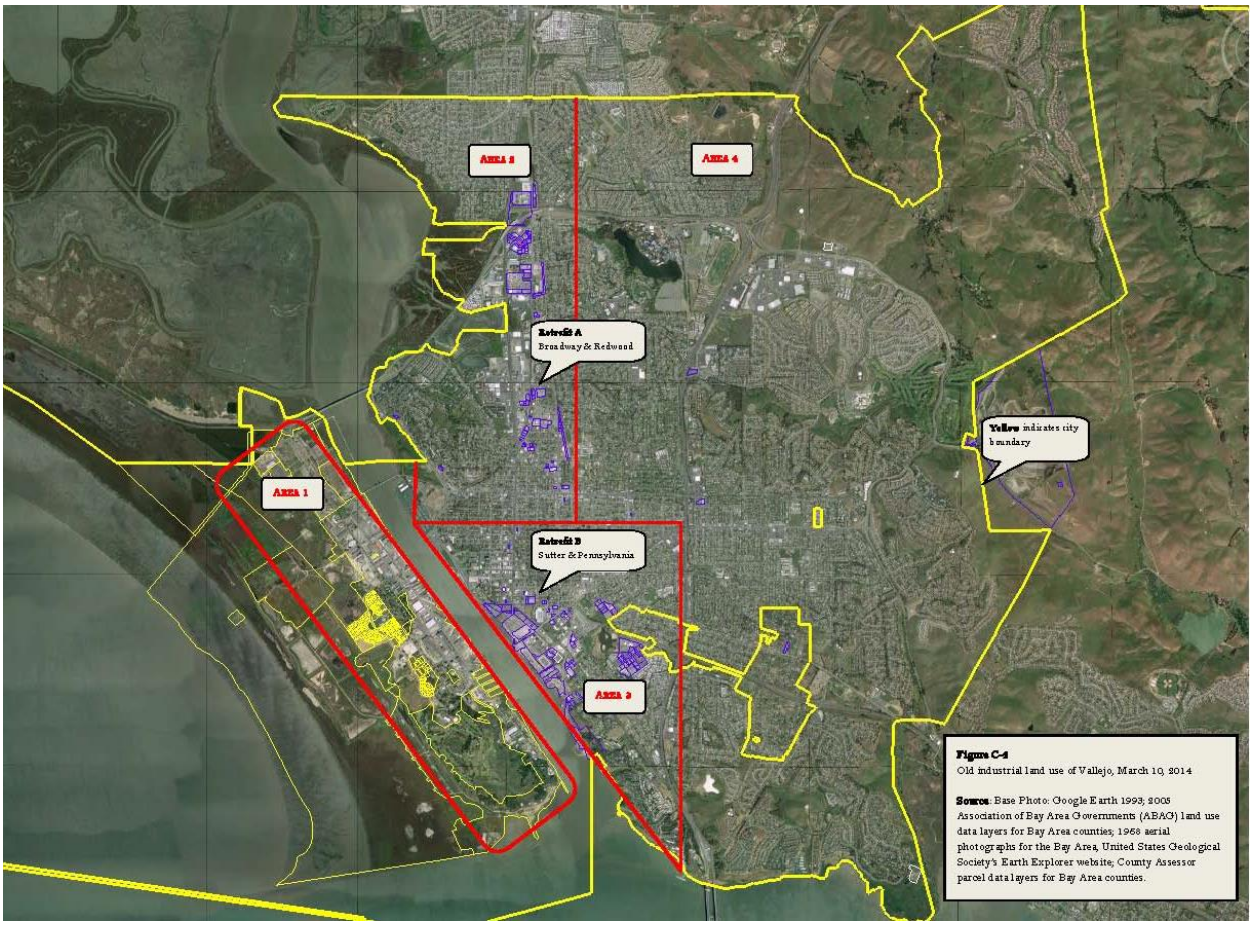
Area 1 is on Mare Island, a former Navy base, now consisting of commercial land use typically on the east side of the island with the west side containing newly developed residential areas. The older industrial areas of the island are devoid of curbing making increased street sweeping an unlikely candidate for PCB removal. For the next permit cycle retrofits based on the success of the planned installations in Area two and Area three will be examined for potential similar installations in this area.

Area 2 is located in the north west area of Vallejo. Area 2 is largely commercial with some residential land use and some older unused commercial areas. The majority of this area contains intact curbing and gutters so the potential for enhanced street sweeping as a method of contaminate reduction exists. This area is regularly swept by the City of Vallejo with a typical frequency of once per month. This will be also the location of the soon to be installed vegetative swale identified in Figure C-2 as Retrofit A.

Area 3 is located in the southwest corner of the City. This area consists of older commercial areas dispersed within residential land use. Some areas contain viable curb and gutter so increased street sweeping may be investigated as a potential enhancement method. As in Area two this area is regularly swept by the City of Vallejo. Area three is the location of the scheduled Contech storm filter installation.

Area 4 is located on the eastern side of the City. This area contains mostly residential land use with very few older commercial areas. Typically the curb and gutters in these areas are intact. Increased street sweeping will be the main consideration in this area for the next permit cycle. As with area two and three this area is regularly swept by the City of Vallejo.

Figure C-2



In compliance with the Municipal Regional Stormwater permit provisions C11 and C12, two stormwater treatment retrofits are scheduled for installation in March 2014. These retrofits are part of the Clean Watersheds for a Clean Bay project in Solano County which will consist of an initial screening phase and a BMP assessment phase. The initial screening phase will gather data on pollutant concentrations, including pollutant concentrations associated with <25 micron particle size fraction. After the screening phase the BMP assessment will be conducted.

Retrofit A is scheduled for installation at the southeast corner of Broadway and Redwood Street. This retrofit will consist of a vegetated swale that is approximately 120’ long adjacent to a railroad track.

Retrofit B is scheduled for installation on the east side of Sutter Street at Pennsylvania Street adjacent to a PG&E sub station. This retrofit will consist of a two cartridge linear precast Contech storm filter. The existing stormdrain inlet in this area will be replaced with the storm filter.

Potential Urban Runoff Controls for PCBs

Existing Solano Program components include illicit discharge controls, industrial/commercial facility inspections and public outreach. Typical facets of these components that have some potential to reduce PCBs discharges include:

- Responding to reports of illicit discharges, conducting illicit discharge field investigations and performing enforcement activities.
- Inspecting industrial and commercial facilities and performing enforcement activities as needed.
- Sponsoring and/or coordinating with household hazardous waste collection programs.
- Educating the public and businesses about stormwater pollution prevention and control and encouraging participation in related efforts.

The potential for these activities to control PCBs may be limited, since the current use of PCBs is limited and strictly regulated by the U.S. EPA.

The controls described below are selected potential PCBs stormwater control options and the advantages, limitations and cost factors are qualitatively discussed below, without attempting to quantify costs or benefits. Eight options have been identified and placed in three categories: soil/sediment cleanup, pollution prevention/source control, and stormwater treatment.

Soil/Sediment Cleanup

- Cleanup of Sites with PCBs in Erodible Soils
- Increased Removal of Sediments During Routine Maintenance of Storm Drain Systems
- Non-routine Removal of Sediments Containing PCBs from Stormwater Conveyances
- Natural Attenuation

Pollution Prevention/Source Control

- Voluntary Replacement of PCBs-containing Equipment
- Outreach to Parties Performing Demolition

Stormwater Treatment

- Stormwater Runoff Treatment Retrofits
- Diversion of Stormwater Flows to Wastewater Treatment Plants

Selected options are described in detail in the following sections.

1. Increased Removal of Sediments During Routine Municipal Maintenance Activities

   As discussed earlier, some mass of sediment and associated particle-bound pollutants, including PCBs, is removed during routine municipal maintenance practices such as

inlet/catch basin cleaning, street sweeping and channel desilting. This control option requires modification of maintenance practices to increase removal of sediment and associated particle-bound pollutants. Potential modifications include increasing the frequency of storm drain inlet/catch basin and pump station sump cleaning, street sweeping and channel desilting.

This approach would have the advantage of building on established practices already implemented in the Bay Area. In addition, it would potentially reduce loadings of other pollutants of concern. One limitation is that most potential modifications would not reduce new inputs of PCBs to storm drains.

Potential costs to implement this control option would include additional labor, maintenance and depreciation of equipment (e.g., street sweepers), and testing and disposal of sediments. When appropriate data are available, the Program is estimating some associated additional costs with the additional pollutant mass removed.

2. Non-routine Removal of Sediments Containing PCBs from Stormwater Conveyances

Storm drain systems are generally designed to efficiently convey stormwater and associated sediments away from urban areas to surface waters. Sediments typically accumulate, however, at depositional areas within a system, including flood control channels in low lying areas and low areas in storm drain system pipes caused by settlement. Sediments also accumulate by design in structures such as pump station wet wells and detention basins. Sediments are removed from storm drain conveyances to some extent during routine maintenance practices.

The enhanced sediment management practice being evaluated in the pilot watersheds is street sweeping. As described in IMR Part B Section B.5, pilot street sweeping studies are currently being conducted, and final results will not be reported until 2015. However, initial findings of a literature review of the subject (EOA and Geosyntec Consultants) are consistent with field observations during the first enhanced street sweeping studies conducted in 2014 in the pilot watersheds: key factors affecting the efficiency of street sweepers include the condition of the roads, the type of street sweeper, and the skill and care of the operator.

Some practical lessons resulted from specific changes to street sweeping practices recently implemented by Permittees (see IMR Part B Appendix B.5.B). In Richmond, a section of Hoffman Boulevard adjacent to the metal recycler was not previously on the regular street sweeper logs. In North Richmond, a section of Market Avenue that previously had no paved shoulders or curbs was reconfigured, allowing street sweeping where it had not previously occurred.

The estimated load reduction benefit from these changes depends on the PCB concentration in source area sediments, among other factors. In the Richmond location, where sediment PCB concentrations are approximately 1,000 µg/kg, initiation of street sweeping along 0.3 miles of Hoffman Boulevard is estimated to reduce or avoid approximately 3 grams of PCBs annually. In contrast, sediments in the North Richmond watershed have approximately three- to fivefold lower PCB concentrations, with correspondingly lower PCB load reduction benefits from street sweeping. The load reduction estimates for the Hoffman location will be

improved as a result of the pilot street sweeping study; however, based on literature reviews and practical assessments, the above estimates are not expected to change by an order of magnitude.

Other enhanced sediment management pilot projects are being evaluated and are documented in IMR Part B Section B.6. Those pilot projects include pump station cleaning, storm drain line cleaning / flushing, and street flushing. Pump station cleaning is not applicable to the Parr and Lauritzen watersheds, as there are no stormwater pump stations downstream of the affected area having high PCB concentrations in sediments. Storm drain line cleaning and flushing was evaluated as a potential pilot project in the Parr and Lauritzen watersheds; however, the confounding influences of tidal intrusion and aging infrastructure precluded conducting such a pilot study within the schedule and budget constraints of the pilot projects. The potential for maintenance and rehabilitation of the stormwater conveyance system in the Parr and Lauritzen watersheds to benefit PCB management will need to be evaluated in the future, in the context of rehabilitation of aging infrastructure.

A street washing and flushing pilot project was previously evaluated in Oakland, and another is being conducted in San Mateo. Using pressurized water to dislodge sediments from the nooks and crannies of city streets can be thought of as extremely high-efficiency street sweeping that generates liquid waste and costs substantially more than street sweeping alone. For context, the pilot study in the city of Oakland cost 100,000 and removed approximately 9 grams of PCBs from city streets. One of the significant challenges to both street and pipe flushing is disposal of the water; therefore, street and pipe flushing may be more implementable in conjunction with diversions to sanitary sewers (see Section 5 below), where the infrastructure allows such an approach. In the Parr and Lauritzen watersheds, the option to divert to sanitary sewers is not available, as the existing system is already susceptible to sanitary sewer overflows and upsets caused by stormwater inflow and infiltration.

The Alameda County Clean Water Program regional sediment surveys revealed that some urban stormwater conveyances contain reservoirs of sediments with PCBs and other pollutants of concern. Little is known about the spatial extent and residence time of such sediments in the system. This approach would initially use field investigations to identify conveyances with accumulated sediments containing PCBs (and potentially other pollutants of concern). These sites should be prioritized and targeted for dry season sediment removals with proper disposal implemented. In general, the fieldwork would not be associated with routine municipal maintenance practices and would require extra mobilization of labor and equipment.

An advantage to this approach is that it would directly remove PCBs and potentially other pollutants of concern from stormwater conveyances. A potential limitation is that periodic removal actions might be needed if there are ongoing inputs of PCBs to a storm drain conveyance. Thus identification and abatement of any ongoing inputs would be desirable before performing removal actions. On the other hand, removing sediments and then testing new sediments that accumulate would help determine whether there are continuing inputs to the system. Another potential limitation to this approach is that in some creeks and flood control channels removal of sediment would conflict with regulations designed to protect in-channel habitat. Parties performing projects that include substantial sediment removal are

required to obtain Clean Water Act Section 401 water quality certifications from the Regional Board before work commences.

Costs associated with this control option would include identifying stormwater conveyances containing accumulated sediments with PCBs and sediment removal actions in selected areas. Sediment removal costs would depend on factors such as the type of conveyance, the extent and concentrations of PCBs (and other pollutants), and the cleanup standard chosen. The number of areas that would be cleaned out in association with the Bay PCBs TMDL is difficult to predict. More data is needed on the extent of stormwater conveyances that drain to the Bay with significant accumulations of sediments containing PCBs. Removal actions could be prioritized based on criteria such as costs, mass of PCBs present and whether a responsible party could be identified. Responsible parties would ideally perform sediment removal and disposal, but their identification would likely be infeasible in many cases.

3. Natural Attenuation

This approach allows PCBs in soils and accumulated stormwater conveyance sediments to naturally degrade or be flushed through the system. No actions would be taken except periodic monitoring. The principal advantage of this approach is that the only costs incurred would be for periodic monitoring to evaluate whether concentrations were declining in urban runoff. However, since PCBs degrade very slowly in the environment, a prohibitively long time period might be required for concentrations to attenuate to acceptable levels. In addition, this strategy does not address any new inputs to soils or stormwater conveyances, and does not reduce loadings to the Bay on the short term.

4. Voluntary Replacement of PCBs-containing Equipment

The U.S. EPA still allows the use of PCBs in limited applications. As discussed previously, a lack of availability and health and safety concerns have effectively ended the use of PCBs in new applications (EIP Associates 1997). However, PCBs may remain in some older equipment, including enclosed electrical applications such as transformers and capacitors.

This control option encourages identification and voluntary replacement of PCBs-containing equipment. Implementation actions include targeted outreach on identifying equipment with PCBs, obtaining suitable replacements and proper decommissioning methods. In addition, regulatory incentives could potentially be developed to make equipment replacement more attractive to facility owners. An advantage to this approach is that removing PCBs-containing equipment from service could potentially reduce new inputs of PCBs to the environment and storm drain conveyances. Another advantage could be reducing potential liability to equipment owners associated with accidental PCBs releases and health and safety concerns. New equipment could also reduce facility operation and maintenance costs (e.g., modernizing electrical equipment could result in energy savings). On the other hand, given that the use of PCBs is currently limited and strictly regulated, the mass of PCBs that could potentially be released to the environment from PCBs-containing equipment may be relatively small. Replacement of such equipment may therefore have only a limited potential benefit. There is also a risk of releases to the environment and human exposure during equipment replacement.

Potential costs include developing and distributing outreach materials and developing and implementing regulatory incentives to replace PCB-containing equipment. Equipment owners would incur labor and capital costs for decommissioning old equipment and purchasing and installing replacement equipment. Decommissioning costs would likely include testing and disposing of PCBs-containing materials.

Equipment in the Bay Area that potentially contains PCBs includes PG&E electrical equipment with dielectric fluids, such as substation transformers. A letter from PG&E to Regional Board staff (Doss 2000a) indicates that the "vast majority of PCB-filled electrical equipment" was removed from its system during the mid-1980s. The letter also states: "Distribution line equipment and all other fluid-filled substation electric equipment contains mineral oil dielectric fluid. ...The over 900,000 mineral oil-filled distribution line pieces of equipment in service are generally not tested for PCBs until fluid is removed at the time of servicing, or in the event of a spill or release of such fluid. PG&E's experience has been that, in general, approximately ten percent of such units contain PCBs at concentrations of 50 parts per million (ppm) or greater, and less than one percent of these units contain PCBs at concentrations of 500 ppm or greater." A follow-up letter (Doss 2000b) states: "The declining percentage of oil-filled units which contain PCBs reflects our efforts to remove such units during servicing, as well as the replacement programs PG&E conducted in the mid-1980s." Further evaluation of this control option should include additional documentation of the current status of PG&E's efforts to remove PCBs from their equipment.

5. Outreach to Parties Performing Demolition

PCBs were formerly used in paints, sealants, and wood preservatives (EIP Associates 1997) and have been found in construction materials such as insulation, roofing and siding materials (64 CFR Part 761). This strategy entails developing an outreach program to reduce potential releases of PCBs during demolition. Targeted outreach would help contractors identify construction materials potentially containing PCBs and implement proper testing, removal and disposal techniques.

This approach has the advantage of potentially reducing new inputs of PCBs to the environment and storm drains. In addition, this strategy could potentially be coordinated with other programs such as asbestos and lead abatement. Potential benefits, however, would be limited to reducing loads by the mass of PCBs in existing structures. Estimating this mass and the potential for its release to storm drains would likely be difficult. Further research on which specific construction materials contained PCBs and the general time period of their use could help target outreach efforts.

Costs to implement this option would include developing and distributing outreach materials. Property owners would potentially incur costs to test materials for PCBs before demolition, implement special removal procedures, and dispose of PCBs-containing materials.

6. Stormwater Runoff Treatment Retrofits

Solids removal is generally the most feasible option to treat PCBs and other sediment-bound pollutants in stormwater runoff. Stormwater treatment structures that remove solids commonly rely on filtration, sedimentation, flow through separation or some combination of

these processes. Structures may be built in-place or proprietary manufactured devices may be installed. Examples include storm drain inlet inserts, manufactured flow through separation devices (e.g., vortex separator), vegetated filtration systems (e.g., grassy swale), infiltration trenches/basins, media filtration (e.g., sand filter), detention basins, wet ponds and constructed wetlands (CASQA 2003).

This approach requires retrofitting stormwater treatment structures such as the above into the urban landscape. Retrofits are potentially applicable at widely varying scales, ranging from, for example, a storm drain inlet filter in a small parking lot to a constructed wetland at the base of a watershed. An advantage to this approach is that stormwater treatment retrofit technologies are readily available and can effectively remove sediment and associated pollutants when designed, installed, operated and maintained properly. One limitation of this approach is that it would not reduce new inputs of PCBs to storm drain conveyances. In addition, siting of some technologies may be limited by factors such as soil types, groundwater elevation, slopes, insect breeding and space constraints. Treatment structures such as wet ponds and constructed wetlands would need to be designed to minimize mercury methylation.

Costs associated with stormwater treatment retrofits include facilitating public involvement, planning and siting (including field reconnaissance), design, permitting, installation/construction and operation and maintenance. For a variety of reasons, available data typically indicate variable treatment performance for a given type of treatment and pollutant, often making comparisons of cost-effectiveness among treatment technologies problematic (CASQA 2003).
In addition to other locations throughout the Bay Area. Two pilot stormwater treatment retrofit projects have been designed and are currently under construction for the Solano Permitees. One of the retrofit projects is downstream from a PG&E substation. The retrofit consists of the installation of a new drainage inlet downstream from the substation. The new drainage inlet will provide treatment by capturing pollutants in a replaceable media filter cartridge.

The second retrofit project for the Solano County Permitees is a vegetated swale. The project catchment is just under an acre. The treatment measure for the project consists of a vegetated swale in an existing ditch along a Southern Pacific railroad track and Broadway Street in Vallejo.

The swale will collect runoff from the sidewalk and northbound lanes of Broadway Street. The bottom of the swale and the side slopes will be planted with native bio swale sod for treatment and aesthetic purposes. See part B of the IMR for further details on these projects. The design cost for both Solano projects totals $61,442 while the construction bids came in at nearly $98,000. Team Ghilotti Construction is the contractor for these projects.

7. Diversion of Stormwater Flows to Wastewater Treatment Plants

Sanitary sewer collection systems and wastewater treatment plants are often designed with capacity exceeding that needed to accommodate dry weather flows. The extra capacity is typicall used to treat increased wet weather flows caused by inflow and infiltration into the collection system and to accommodate population growth in a community.

This strategy would divert dry weather urban runoff and first flush urban runoff flows to wastewater treatment plants for removal of PCBs and other pollutants (LWA 2002, Abu-Saba 2002). This practice has been implemented in Southern California during dry weather flows to reduce microorganism levels associated with beach closures. However, urban runoff typically only has significant concentrations of suspended solids and associated pollutants during wet weather, with the highest levels found during first flush storm events. Applying this strategy to reduce loads of particle-bound pollutants such as PCBs would therefore require diversion and treatment of first flush wet weather flows.

This approach includes identifying and quantifying conditions under which first flush flows could be diverted to wastewater treatment plants. It has the advantage of potentially using available treatment capacity of existing treatment works, rather than constructing new stormwater treatment facilities. A principal limitation is that the sanitary sewer system and wastewater treatment plants may not have sufficient available capacity to accept large additional flows or sediment-laden flows during wet weather. Available capacity in existing facilities was generally not designed and constructed to accept stormwater flows. Storage of urban runoff and subsequent treatment during lower sanitary system flows could potentially help address this issue but may be difficult to achieve in light of the quantity of stormwater leaving the urban environment during a given storm event and the required sizing of the storage facilities to accommodate these flows.

Another potential limitation is the ability of wastewater treatment plants accepting urban runoff to meet certain requirements of their current NPDES permits. Such requirements include removal of suspended solids and biological oxygen demand, meeting toxic pollutant effluent and biosolids limits (sometimes including mass limits), and complying with bypass prohibitions. Also, sanitary sewer ordinances typically contain prohibitions against the intentional introduction of flows other than wastewater into the sanitary sewer system. In addition, managers should consider the potential negative impacts of reducing flows and changing sediment deliveries to receiving waters before diverting stormwater flows.

The Solano County pilot diversion project is being implemented by the Fairfield-Suisun Urban Runoff Program (FSURMP) and Fairfield-Suisun Sewer District (FSSD). The project involves changes to the operation of an existing pump station so as to divert stormwater from the station to the FSSD wastewater treatment plant. The State Street pump station is located in the City of Fairfield just upstream of Suisun City. It serves a watershed area of approximately six acres. The contributing area is commercial, of which a significant portion is automotive repair. (See Part B for further details).

The pump station changes evaluated for this project include:

- Shutting off the stormwater pump station during dry weather;
- Removing standing water in the pump station wet well throughout the dry season and before the first flush; and
- Monitoring concentrations of pollutants and pollutant indicators in the diverted water

Normal discharges from the State Street Pump Station were terminated in mid-June 2012. The contents of the pump station's wet well (approximately 825 gallons) were subsequently removed by FSSD staff using a Vactor truck. Prior to removal, the discharge pumps were operated to mix the contents and to collect a representative sample. This June 18, 2012 sample was analyzed for PCBs, mercury, total organic carbon, total metals, and suspended sediment concentration. The contents were trucked and discharged to the FSSD treatment plant. As an in-house pilot project, there were no formal agreements needed for treatment plant's acceptance of the discharge.

DISCUSSION AND CONCLUSION

The regional sediment surveys and PCBs case studies performed to-date by Bay Area stormwater management agencies have relied on analysis of embedded sediment samples collected from stormwater conveyances. Pollutant loadings estimated using this data are highly uncertain, since a variety of chemical and geomorphic processes lead to high spatial and temporal variability in the concentrations of PCBs and other pollutants found in embedded sediments.

There are a variety of potential management measures that may reduce loads of PCBs associated with urban runoff. In the late 1970s, uses of PCBs were restricted and new uses effectively eliminated. It is therefore likely that new releases of PCBs to the environment have greatly diminished during the past few decades. As a result, pollution prevention/source control measures, such as replacing equipment that contains PCBs, may have less potential to reduce loads than intercepting existing reservoirs of PCBs in erodible soils and stormwater conveyance sediments before they reach the Bay.

One way to prioritize implementation of urban runoff controls for PCBs and other particle-bound pollutants of concern would be to focus efforts on watersheds discharging relatively high loads of pollutants. Characterization techniques better suited to estimating loads than embedded sediment sampling would allow for a more refined prioritization of watersheds and assessment of the effectiveness of new control measures. However, widely implementing such methods may be cost-prohibitive to Bay Area stormwater programs at this time.

Factors other than strict cost-effectiveness are also important in assessing feasibility, such as the likelihood of identifying responsible parties or obtaining state or federal funding for identification and cleanup of on-land PCBs sites. The benefit of implementing strategies that address multiple sediment-bound pollutants should also be taken into consideration. Bay Area stormwater management agencies plan to continue working with Regional Board staff in coordination with BASMAA, and the San Francisco Estuary Regional Monitoring Program to address controllable sources of PCBs.

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